ROYAL ASTRONOMICAL SOCIETY.

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SIR JOHN F. W. HERSCHEL, Bart., President, in the Chair.

Edward Joseph Lowe, Esq., of Highfield House, near Nottingham, was balloted for, and duly admitted a Fellow of the Society.

FLORA.

Observations.

GÖTTINGEN. Meridian. (Professor Gauss.)

1847.	Göttingen M.T. h m s	R.A. ° ′ ″	N.P.D. ° ′ ″
Dec. 10	11 11 4	66 47 26·2	75 37 9·9
11	6 7	32 5·4	34 17·4
12	11 1 11	66 16 59·8	75 31 20·0

HAMBURG. Meridian Circle. (M. Rümker.)

1847.	Hamburg M.T. h m s	R.A. ° ′ ″	N.P.D. ° ′ ″
Nov. 16	13 10 50·1	73 9 28·4	76 13 18·3
17	5 59·2	72 55 41·3	12 52·9
18	13 1 6·8	72 41 31·8	12 27·1
21	12 46 21·7	71 57 3·8	10 33·8
22	41 23·1	41 37·4	9 45·8
24	31 26·3	71 10 1·4	7 47·8
27	16 23·5	70 21 8·0	4 7·9
28	12 11 21·4	70 4 31·0	76 2 41·9
Dec. 1	11 56 13·8	69 14 26·4	75 57 46·7
4	41 6·4	68 24 22·2	51 53·7
7	26 2·0	67 35 4·1	44 59·0
8	11 21 1·7	67 18 56·3	42 29·9
18	10 32 4·3	64 53 57·4	11 15·6
19	27 18·8	41 31·5	7 35·0
20	10 22 35·6	64 29 38·4	75 3 45·7

HAMBURG. With the Equatoreal and Micrometer. (M. Rümker.)

1847.	h m s	° ′ ″	° ′ ″
Nov. 21	9 1 7·8	71 59 35·1	76 10 38·2
25	8 21 7·5	70 55 46·4	76 6 55·6
Dec. 4	9 14 4·4	68 26 6·6	75 52 7·6
6	15 5 29·1	67 50 10·7	75 47 13·5
17	7 43 15·4	65 8 31·6	75 15 23·2

WASHINGTON. (Lieut. M. F. Maury, U.S.N.)

1847.	Washington M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	No. of Obs. R.A.	No. of Obs. N.P.D.	Instrum.	Star of Comp.
Nov. 29	12 5 11	4 39 5·64	76 0 46·1	2	1	*Mer. C.	
		5·51		1		W. Tran.	
Dec. 3	11 44 55	34 27·70	75 53 25·2	1	1	Mur. C.	*a* in R.A.
	13 25 15	22·37	19·2	18	6	Equat.	*a*
4	6 54 30	33 35·16		8		Equat.	*b*
	6 46 40		75 51 45·2		2	—	*b*
6	8 0 23	31 19·44	75 47 8·2	12	5	—	*b* and *c*
	11 29 50	31 9·51		7		W. Tran.	
		9·83	75 46 48·9	7	1	Mer. C.	
			48·8		1	Mur. C.	
7	11 24 49	30 4·35	75 44 21·1	7	1	Mer. C.	
		4·48		5		W. Tran.	
			75 44 23·5		1	Mur. C.	
8	11 19 49	4 29 0·20		5		W. Tran.	
		0·38	75 41 51·1	7	1	Mer. C.	
			56·0		1	Mur. C.	

The observations are corrected for refraction only.

Mean Places of the Stars of Comparison, 1847·0 :—

	R.A. h m s	N.P.D. ° ′ ″	Authorities. R.A.	Decl.
a	4 33 25·76	75 58 18·7	Rümker, 1256.	Washington Obs.
b	37 54·23	45 8·7	Bessel, iv. 824, H.C. p. 203.	—
c	4 36 4·45	75 39 44·5	Rümker, 1265.	—

* The names of the observers, though given by Lieut. Maury, are omitted here from want of space: there can be no doubt of their skill or fidelity. The wealth of the Observatory in instruments is rather perplexing: a large Equatoreal, a Transit, distinguished by its locality as West, a Meridian Circle, and a Mural Circle, have all been employed.

Elements. By Mr. Graham, of the Observatory, Markree.

Epoch 1848, Jan. 1·0, Greenwich Mean Time.

	° ′ ″	
Mean Anomaly	35 33 0·27	
π	33 26 55·31	Mean Eq.
Ω	110 13 26·98	1848·0
i	5 53 57·12	
φ	8 55 59 11	

$\mu = 1085''{\cdot}8205$ Log $a = 0{\cdot}3428324$.

These elements are deduced from the South Villa Observations of October 18, and from the following Markree places:—

Greenwich M.T. 1847.	R.A. ° ′ ″	N.P.D. ° ′ ″
Nov. 17·569130	72 55 2·10	76 12 51·0
Dec. 18·462247	64 53 21·15	75 11 6·8

For the middle place:—

	Calc^{d}—Obs^{d}. ″
Longitude =	+1·3
Latitude =	−0·2

Ephemeris. For Greenwich Mean Midnight.

By Mr. Hind, from his *Third* Elements.

1848.	R.A. h m s	N.P.D. ° ′ ″	1848.	R.A. h m s	N.P.D. ° ′ ″
Feb. 1	4 18 36·97	71 9 30·0	Feb. 22	4 40 55·48	69 2 38·6
2	19 24·64	71 3 15·5	23	42 14·67	68 56 59·4
3	20 14·11	70 57 1·4	24	43 35·06	51 23·3
4	21 5·35	50 47·9	25	44 56·64	45 50·3
5	21 58·33	44 35·0	26	46 19·38	40 20·6
6	22 53·01	38 23·0	27	47 43·27	34 54·2
7	23 49·38	32 12·0	28	49 8·28	29 31·3
8	24 47·39	26 1·8	29	50 34·40	24 12·1
9	25 47·01	19 52·7	March 1	52 1·61	18 56·6
10	26 48·21	13 44·8	2	53 29·88	13 44·9
11	27 50·96	7 38·3	3	54 59·20	8 37·1
12	28 55·23	70 1 33·3	4	56 29·56	68 3 33·4
13	30 1·01	69 55 30·0	5	58 0·93	67 58 33·8
14	31 8·25	49 28·5	6	4 59 33·28	53 38·4
15	32 16·93	43 29·0	7	5 1 6·60	48 47·3
16	33 27·02	37 31·6	8	2 40·86	44 0·7
17	34 38·48	31 36·4	9	4 16·04	39 18·6
18	35 51·28	25 43·6	10	5 52·11	34 41·0
19	37 5·40	19 53·3	11	7 29·06	30 8·1
20	38 20·83	14 5·6	12	9 6·88	25 39·9
21	4 39 37·53	69 8 20·7	13	5 10 45·54	67 21 16·6

1848.	R.A. h m s	N.P.D. ° ′ ″	1848.	R.A. h m s	N.P.D. ° ′ ″
Mar. 14	5 12 25·02	67 16 58·3	April 8	5 57 30·21	65 59 29·3
15	14 5·31	12 45·0	9	5 59 25·48	57 42·2
16	15 46·37	8 36·9	10	6 1 21·18	56 1·6
17	17 28·18	4 33·9	11	3 17·28	54 27·5
18	19 10·74	67 0 36·2	12	5 13·76	52 59·9
19	20 54·02	66 56 43·8	13	7 10·63	51 38·8
20	22 38·01	52 56·8	14	9 7·84	50 24·3
21	24 22·69	49 15·3	15	11 5·40	49 16·5
22	26 8·05	45 39·3	16	13 3·31	48 15·3
23	27 54·08	42 8·9	17	15 1·53	47 20·7
24	29 40·76	38 44·2	18	17 0·05	46 32·8
25	31 28·08	35 25·2	19	18 58·86	45 51·6
26	33 16·02	32 12·0	20	20 57·97	45 17·0
27	35 4·58	29 4·6	21	22 57·38	44 49·2
28	36 53·74	26 3·1	22	24 57·08	44 28·1
29	38 43·48	23 7·5	23	26 57·05	44 13·7
30	40 33·80	20 17·9	24	28 57·28	44 6·1
31	42 24·67	17 34·3	25	30 57·75	44 5·2
April 1	44 16·10	14 56·9	26	32 58·45	44 11·1
2	46 8·07	12 25·6	27	34 59·38	44 23·9
3	48 0·56	10 0·5	28	37 0·53	44 43·5
4	49 53·56	7 41·6	29	39 1·90	45 9·9
5	51 47·04	5 29·0	30	41 3·49	45 43·2
6	53 40·98	3 22·7	May 1	6 43 5·27	65 46 23·3
7	5 55 35·37	66 1 22·8			

This ephemeris gives the places of the planet reckoned from the *true* equinox of date: the aberration has not been applied. By adding the correction due to aberration from the annexed table to the values of the ephemeris, the *apparent* places of the planet will be obtained.

1848.	Corr. for Aberr. R.A. s	N.P.D. ″	497″·8 × Δ m s	Hor. Par. ″	1848.	Corr. for Aberr. R.A. s	N.P.D. ″	497″·8 × Δ m s	Hor. Par. ″
Feb. 1	−0·37	−3·0	11 26·3	6·23	Mar. 20	−1·19	−2·6	16 27·0	4·33
5	0·44	3·1	11 49·6	6·02	24	1·25	2·4	16 52·7	4·22
9	0·51	3·1	12 13·5	5·82	28	1·32	2·1	17 18·2	4·11
13	0·58	3·2	12 37·9	5·63	April 1	1·37	1·9	17 43·7	4·01
17	0·65	3·2	13 2·6	5·46	5	1·43	1·6	18 9·0	3·92
21	0·72	3·2	13 27·6	5·29	9	1·49	1·3	18 34·0	3·83
25	0·79	3·2	13 52·9	5·13	13	1·54	1·0	18 58·8	3·75
29	0·86	3·1	14 18·4	4·98	17	1·60	0·7	19 23·3	3·67
Mar. 4	0·93	3·1	14 44·0	4·83	21	1·65	−0·3	19 47·6	3·60
8	1·00	3·0	15 9·7	4·69	25	1·69	0·0	20 11·5	3·53
12	1·06	2·9	15 35·5	4·56	29	−1·74	+0·4	20 35·1	3·46
16	−1·13	−2·7	16 1·3	4·44					

NEPTUNE.

Observations.

HAMBURG. Meridian Circle. (M. Rümker.)

1847.	Hamburg M.T. h m s	R.A. ° ′ ″	N.P.D. ° ′ ″
Oct. 12	8 37 44·0	330 11 54·3	102 48 32·3
14	29 45·5	10 13·6	49 5·4
15	25 46·7	9 29·8	49 20·9
16	21 47·8	8 45·1	49 35·8
17	17 49·1	8 3·0	49 47·2
18	8 13 50·3	7 20·1	50 5·6
22	7 57 56·1	4 40·8	50 55·1
24	50 0·8	3 47·6	51 21·8
25	46 3·0	3 20·4	51 31·0
26	42 5·0	2 47·5	51 39·9
27	38 7·4	2 20·5	51 44·9
28	34 10·0	2 0·3	51 51·7
29	30 13·8	1 40·8	52 1·8
Nov. 2	7 14 24·2	330 0 26·8	52 26·2
10	6 42 54·0	329 59 41·7	52 33·9
17	15 27·2	330 0 50·5	52 8·8
18	6 11 32·7	1 10·9	51 59·3
21	5 59 49·0	2 11·4	51 34·7
24	48 6·4	3 29·6	51 6·4
27	36 25·4	5 9·4	50 27·5
28	32 31·7	5 44·1	50 12·2
Dec. 4	5 9 13·8	10 7·4	48 38·0
8	4 53 44·2	13 38·5	47 19·9
12	38 16·4	17 37·0	45 49·3
17	4 18 59·5	330 23 18·5::	102 43 49·6:

Transit. (Mr. George Rümker.)

1847.	Hamburg M.T. h m s	R.A. ° ′ ″	1847.	Hamburg M.T. h m s	R.A. ° ′ ″
Sept. 7	10 58 11	330 54 36·7	Oct. 25	7 46 3	330 3 21·4
10	46 6	50 10·0	26	42 5	2 46·8
15	25 58	43 0·1	Nov. 2	7 14 24	0 27·7
18	10 13 54	38 58·5	18	6 11 33	1 12·4
26	9 41 45	28 35·1	21	5 59 49	2 7·7
27	37 44	27 25·9	27	36 26	5 12·6
Oct. 4	9 9 42	19 32·8	28	32 31	5 41·1
12	8 37 44	11 56·1	Dec. 4	5 9 14	10 11·3
24	7 50 1	330 3 50·0	12	4 38 17	330 17 41·2

Elliptic Elements. By Professor S. C. Walker.

Epoch	328° 31′ 56″·36	G. M. Noon, Jan. 1, 1847
Longitude Perihelion	48 21 2·93	M. E. Jan. 1, 1847
Ascending Node	130 4 35·03	
Inclination	1 46 59·54	
Excentricity	0·00857741	

Mean Daily Siderial Motion 21″·55448 Period 164·6181 Tropical Years.

" On applying the perturbations computed by Professor Peirce to the true longitude and radius vector, the ephemeris affords the following comparison with direct observation :—

		R.A. Obs^{d}—Calc^{d}.	Decl. Obs^{d}—Calc^{d}.
		″	″
1795	May 9	+3·1	−0·7
1846	Nov. 7	−2·7	1·2
1847,	April 6	−1·3	2·5
1847	Aug. 22	+0·3	−0·1

" A change of one year in the periodic time would vary the relative differences of the computed places for Nov. 7, 1846, and April 6, 1847, by 11″·4."

Perturbations.

By Professor Peirce, of the University of Cambridge, U.S.

" The following formulæ are expressions of a first approximation to a theory of the perturbations of *Neptune* by the other planets. All the terms (as high as the first power of the excentricity of the disturbing planets) are retained, which can affect the longitude 0″·01 ; the terms dependent on the squares of the excentricities, as well as those which depend on the excentricity of *Neptune*, are neglected. The relative inclinations of the orbits, the secular changes in the elements of the disturbing planets, and the great inequality of the motions of *Jupiter* and *Saturn*, are also neglected. Mr. S. C. Walker's elements of *Neptune* are adopted, neglecting the excentricity and assuming (for convenience of computation) a mean motion exactly half that of *Uranus*. The elements of the disturbing planets are taken from Bouvard's tables. The masses are

$$\text{Jupiter} = \frac{1}{1048}; \quad \text{Saturn} = \frac{1}{3501}; \quad \text{Uranus} = \frac{1}{24605}.$$

The last being taken from Lamont's determination. The neglected terms are so small or of so long a period, that they cannot materially interfere with the principal design of this approximation, which is that of enabling astronomers to free the observations of *Neptune* from the effects of perturbation, and thus to obtain the true elliptic elements which may be used for a complete theory of the planet. The mean longitude of each planet is denoted by its

initial letter, and the longitude of the perihelion by prefixing π to the symbolic letter; t is the number of Julian years after Jan. 1, 1850."

Perturbations of True Longitude, v.

$$
\begin{aligned}
\delta v = & -(1''.87 - 0''.0688\, t)\sin(U-N) \\
& +(6''.55 - 0''.2903\, t)\cos(U-N) \\
& -7''.40\sin 2(U-N) - 0''.87\cos 2(U-N) \\
& -1''.56\sin 3(U-N) - 0''.10\cos 3(U-N) \\
& -0''.47\sin 4(U-N) - 0''.10\cos 4(U-N) \\
& -0''.19\sin 5(U-N) - 0''.06\cos 5(U-N) \\
& -0''.08\sin 6(U-N) - 0''.03\cos 6(U-N) \\
& -0''.04\sin 7(U-N) - 0''.02\cos 7(U-N) \\
& -0''.02\sin 8(U-N) - 0''.01\cos 9(U-N) \\
+ & \ 0''.0404\, t - 0''.001851\, t^2 + 0''.0168\, t\cdot\cos(N-\pi U) \\
+ & \ 18''.35\sin(S-N) - 0''.28\sin 2(S-N) - 0''.02\sin 3(S-N) \\
+ & \ 0''.25\sin(S-2N+\pi S) + 0''.01\sin(S-\pi S) \\
+ & \ 0''.36\sin(2S-3N+\pi S) + 0''.52\sin(2S-N-\pi S) \\
+ & \ 0''.01\sin(3S-2N-\pi S) + 0''.0025\, t\cdot\cos(N-\pi S) \\
+ & \ 33''.59\sin(J-N) - 0''.01\sin 2(J-N) \\
+ & \ 0''.01\sin(J-2N+\pi J) + 0''.80\sin(2J-N-\pi J) \\
+ & \ 0''.0035\, t\cos(N-\pi J) + 0''.02\sin(E-N)
\end{aligned}
$$

Perturbations of Radius Vector, r.

$$
\begin{aligned}
\delta r = & \ 0.0000123\, t + 0.01346 \\
& +(0.00236 - 0.0000128\, t)\cos(U-N) \\
& -(0.00015 + 0.0000156\, t)\sin(U-N) \\
& + 0.00091\cos 2(U-N) - 0.00012\sin 2(U-N) \\
& + 0.00021\cos 3(U-N) - 0.00005\sin 3(U-N) \\
& + 0.00007\cos 4(U-N) - 0.00002\sin 4(U-N) \\
& + 0.00006\cos 5(U-N) - 0.00001\sin 5(U-N) \\
& + 0.00001\cos 6(U-N) + 0.00001\cos 7(U-N) \\
& + 0.0000114\, t\sin(N-\pi U) \\
& + 0.00275\cos(S-N) + 0.00003\cos 2(S-N) \\
& + 0.00003\cos(2S-N-\pi S) - 0.00006\cos(N-\pi S) \\
& + 0.0000006\, t\sin(N-\pi S) \\
& + 0.00496\cos(J-N) + 0.00013\cos(2J-N-\pi J) \\
& - 0.00019\cos(N-\pi J) + 0.0000003\, t\sin(N-\pi J)
\end{aligned}
$$

"The perturbations for the following dates have been computed from the preceding formulæ, and must be added with reversed sign to the heliocentric longitudes and radii vectores deduced from observation, in order to obtain those which correspond to the pure elliptic motion."

			$\delta v.$	$\delta r.$				$\delta v.$	$\delta r.$
			″					″	
1795	May	9	+37·60	+0·01207	1847.	June	1	+30·65	+0·01458
1846	Sept.	1	+32·00	+0·01660		July	1	30·23	·01437
	Oct.	1	32·09	·01637		Aug.	1	29·76	·01417
	Nov.	1	32·11	·01613		Sept.	1	29·24	·01397
	Dec.	1	32·07	·01590		Oct.	1	28·67	·01378
1847	Jan.	1	+31·97	+0·01567		Nov.	1	28·06	·01360
	Feb.	1	31·82	·01545		Dec.	1	27·41	·01343
	Mar.	1	31·61	·01522	1848.	Jan.	1	+26·71	+0·01325
	April	1	31·34	·01501		Feb.	1	+25·97	+0·01308
	May	1	+31·02	+0·01479					

HEBE.

Observations.

WASHINGTON. Equatoreal. (Lieut. M. F. Maury, U.S.N.)

1847.	Washington M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	Stars of Comp.	Mags. noted.
Aug. 10	9 33 25	16 55 17·28	98 59 3·1	B. xvii. 83	
11	8 17 39	55 28·87	99 7 44·6	— 83	
18	9 1 54	57 39·43	100 12 7·1	— 3	9; 9; 9·10
19	8 44 14	58 4·09	21 7·9	— 3	9·10; 9·10
20	9 7 3	16 58 31·30	100 30 21·4	— 3	9·10
25	10 25 9	17 1 11·74	101 16 24·8	— 18	9·10; 9
29	Star of Comparison not in Catalogues.				11·12
30	7 49 59	4 23·83	102 0 5·6	B. xvi. 1139	9·10
Sept. 1	9 11 12	5 55·41	18 18·8	xvii. 155,179	11
3	8 7 39	7 29·08	35 23·5	— 168	10; 10; 10
4	7 42 9	8 16·72	102 43 57·9	B.A.C. 5845	10
6	8 11 4	10 1·28	103 1 18·7	— —	10·11
10	Star of comparison not in Catalogues.				11
13	7 59 54	16 44·81	104 0 2·8	B. xvii. 366	10·11
14	8 55 26	17 50·44	8 29·9	— —	11
15	8 13 52	18 52·86	16 16·8	— 397	10·11
16	7 37 20	19 56·47	24 6·1	— 462	10·11
17	7 54 35	21 3·82	32 13·1	— 392	11·12
20	7 29 20	24 31·04	104 55 30·8	B.A.C. 5949	11
21	7 36 33	25 41·69	105 3 10·9	— —	10; 10·11
22	7 33 50	17 26 54·46	105 10 42·2	— —	11·12

"These observations are corrected for refraction *only*."

"The change of magnitude did not, for some time, suggest to me the idea of a brighter and a darker side to the planet. The first remark to this effect is

entered in my memorandum-book on September 16. It is my habit to note the magnitudes of the new planets at least once during every night's work, and sometimes, when I am not satisfied, twice or thrice. On August 20th I remarked that the magnitude should not be rated higher than the 10 or 10·9 at the highest. On August 29 many observations were made, and I find written opposite the planet, 'difficult to recognise,' 'very faint,' and again, 'planet fading very fast.' On September 1 the planet was noted as 'not larger than 11 mag. I perceive that from night to night it grows fainter.' I only observed *Iris* once on October 3, when its magnitude was noted four times independently, and each time set down as the 9th."

IRIS.

Observations.

HAMBURG. (MM. C. and G. Rümker.)

1847.	Hamburg M. T. h m s	R.A. ° ′ ″	N.P.D. ° ′ ″	
Oct. 10	6 42 3	299 13 32·7		Transit G. R.
11	39 1	299 27 3·0		——
15	27 8	300 24 51·0		——
16	6 24 13	300 40 19·5		——
25	5 59 4	303 14 23·1		——
26	56 23	303 32 58·6		——
Nov. 17	5 1 50·3	311 33 35·6	102 25 25·3	Mer. Circ. C. R.
18	4 59 32·3	311 58 8·0	102 20 13·2	——
28	6 46 54·0	316 16 4·5	101 20 57·6	Equatoreal.
Dec. 1	7 40 37·6	317 37 23·8	101 0 40·5	——
4	6 17 52·2	318 57 25·1	100 40 3·8	——
8	7 34 16·2	320 49 49·5	100 10 10·3	——
12	6 43 15·8	322 42 0·8	99 38 51·4	——

Elements. By Mr. Graham, of the Observatory, Markree.

Epoch 1848, Jan. 1·0, Greenwich Mean Time.

Mean Anomaly.....	330 20 16·70	
π	42 2 1·49	Mean Eq. Jan. 1, 1848.
Ω	259 53 3·11	Mean Eq. Jan. 1, 1848.
i.....	5 28 22·96	
φ	13 10 24·39	
μ ..... 970″·6583	Log a ..... 0·3752935	

These represent accurately in latitude, and within 0″·2 in longitude, the middle place of the observations from which they are deduced; viz.

1847.	G.M.T.	R.A. h m s	N.P.D. ° ′ ″	
Aug.	13·423819	19 57 29·44	103 27 28·5	South Villa.
Oct.	15·397950	20 1 48·97	104 13 16·7	Markree.
Dec.	18·290046	21 42 24·68	98 47 42·5	Markree.

I subjoin the equatoreal co-ordinates:

$$M = 131^\circ\ 13'\ 47''{\cdot}17 + 0''{\cdot}1376\,t + 1''{\cdot}001\,E$$
$$N = 40\ 30\ 53{\cdot}87 + 0{\cdot}1361\,t + 0{\cdot}991\,E - 0{\cdot}11\,d\omega$$
$$P = 55\ 28\ 54{\cdot}94 + 0{\cdot}1335\,t + 0{\cdot}976\,E - 0{\cdot}60\,d\omega$$

$$\log m = 0{\cdot}3682635 - 0{\cdot}081\,t - 0{\cdot}59\,E$$
$$\log n = 0{\cdot}3344921 - 0{\cdot}047\,t - 0{\cdot}26\,E - 8{\cdot}7\,d\omega$$
$$\log p = 9{\cdot}9650937 + 0{\cdot}777\,t + 5{\cdot}22\,E + 47{\cdot}6\,d\omega$$

$$\mu = -0{\cdot}4001906 + 2{\cdot}414\,t + 17{\cdot}57\,E$$
$$\nu = -0{\cdot}3198253 - 2{\cdot}435\,t - 17{\cdot}80\,E + 8{\cdot}4\,d\omega$$
$$\varpi = -0{\cdot}1732753 - 1{\cdot}081\,t - 7{\cdot}72\,E - 15{\cdot}5\,d\omega$$

The co-ordinates referred to the true equinox are,

$$x = m \sin(M + \xi) + \mu$$
$$y = n \sin(N + \xi) + \nu$$
$$z = p \sin(P + \xi) + \varpi$$

where t denotes the days from the epoch, 1848, Jan. 1·0

E	the Equation of the Equinoxes in Longitude.
$d\omega$	the Obliquity $- 23^\circ 27' 23''$
ξ	the Excentric Anomaly.

The variations of log m, &c. are to be applied as if all the figures in log m, &c. were *integral* numbers.

SATELLITES OF SATURN.

Observations of Mimas, *the closest and most interior Satellite of Saturn.* By Mr. Lassell.

"It is to be regretted that, owing to the discovery of the closest two satellites of *Saturn* having been made at a period long after the five others became known, it is difficult, in referring to the individuals, to quote them by numerals which shall, explicitly and without ambiguity, point out which satellites are meant.

"Sir John Herschel, seeing this difficulty, has invented and published in his Cape Observations a nomenclature which completely removes it, and moreover will retain its precision should any more satellites hereafter be discovered. He gives a proper name to each of them, and, beginning with that nearest to *Saturn*, designates them thus: *Mimas*, *Enceladus*, *Tethys*, *Dione* *Rhea*, *Titan*, and *Japetus*. I cannot but think this nomenclature a great improvement, and worthy of general adoption.

"Of *Mimas*, the satellite I now refer to, I have obtained, in all, five observations:—

"1846, Aug. 25. About 11½ p.m. M.T. the satellite appeared at its greatest elongation westward. Aug. 30. The satellite ap-

peared a little short of its greatest elongation eastward; and again, on the 1st Sept. at 10 p.m., the satellite appeared a little beyond its greatest eastern elongation.

"During the late opposition of *Saturn*, although I have been very watchful of opportunities, I have been able to see it certainly but twice, viz. on the 16th October and 18th November.

"On the 16th Oct. at 8^h35^m M. T. *Mimas* was, as nearly as I could estimate, exactly at its greatest western elongation, appearing to be five or six tenths of the length of the preceding arm of the ring distant from its extremity. This evening the satellite was better seen than on any other occasion.

"On the 18th Nov. at about $8\frac{1}{2}$ hours, the satellite again appeared as nearly as possible in the same situation as on the 16th October. The power with which *Mimas* was generally best seen is a Coddington lens magnifying 567 times. The difference of visibility between *Mimas* and *Enceladus* is almost incomparable, the latter being instantly seen in my telescope, under all tolerable circumstances, when within 40° or 50° of its greatest elongation; whilst in any but the very finest circumstances *Mimas* is an object of great difficulty."

SATELLITES OF URANUS.*

Observations by Mr. Lassell.

"These observations are principally of the two brightest, those first observed by Sir W. Herschel, or I and II, with estimations of two others, presumed to be his inferior and middle satellites, or 1 and 2. I have not been able to obtain an undoubted observation of any satellite exterior to II.

"The observations are made in position and distance, like those of a double star. The positions are reckoned from the north point as zero, round by the *following* side.

"The results here presented are generally the means of two or three measures. The observations of the I and II, graphically projected, shew *apparently* elliptic orbits, having their transverse axes very nearly perpendicular to the plane of the ecliptic and the proportions of the axes, roughly, as 10 to 6.

"The results marked *e* are careful *estimations* only.

"As to the single observation of the satellite 2, there was unquestionably a point of light at the place indicated, which kept its relative position to the planet for about two hours. Moreover, that part of the sky in which *Uranus* was seen on Nov. 6 was carefully scrutinised on Nov. 8 without my being able to detect any stars in the places where the four satellites had been seen."

* As a temporary nomenclature, we call the two first discovered satellites I and II, and the others 1, 2, 3, 4, reckoning from the planet.

1848.	G.M.T.	1. Pos.	1. Dist.	I. Pos.	I. Dist.	2. Pos.	2. Dist.	II. Pos.	II. Dist.
	h	°		°				°	
Sept. 14	13·6	10 *e*		322 *e*				334·7	
27	9·8	326 *e*		160 *e*				345 *e*	
29	11·5	336 *e*		38 *e*				302·1	28″·98
Oct. 1	12·5	348 *e*		334·6	32″·8			213·4	27·8
2	10·5			307·7				192·1	
11	11·2			294·6	20·57			332·7	41·39
13	10·0			182 *e*				283·0	
15	11·3			133·3	26·27			196·8	33·44
16	9·5			77·6				180	29·15
17	11·0			9·4	27·37			166·1	46·38
Nov. 1	9·4			150				144·1	33·33
6	10·3	349 *e*	11″ *e*	262	20 *e*	80 *e*	10″ *e*	349	45 *e*
8				187·2				316·5	
9	9·5			284·1				163·8	

Note on the Satellites of Uranus. By M. Otto Struve.

The satellites of *Uranus* were first seen by Sir W. Herschel on Jan. 11, 1787, six years after his discovery of the primary planet. By a continued series of observations that year he established the undoubted existence and the approximate distance and periodic times of two *principal* satellites. In a second memoir (*Phil. Trans.* 1798) he announced the discovery of four new *supplementary* satellites; and in a third memoir (*Phil. Trans.* 1815) he presented the results of his observations to that date. The faintness of the objects observed and the mounting of his telescope* sufficiently account for discrepancies in Sir William's results. The measures in distance were, with his means, *exceedingly* difficult: hence we have only two such measures of the interior of the two principal satellites, and none at all of the supplementary satellites. There are, however, several measures of the exterior principal satellite, II.

In the memoir of 1788, Sir William gives 44″·23 as the greatest elongation of II from *Uranus* at his mean distance from the earth, and calculates the similar greatest elongation of I to be 33″, *i.e.* from the periodic time and Kepler's law. He considers these to be approximate only. In the memoir of 1815 he uses in round numbers, and for numerical convenience, 48″ and 36″ for the elongations; and he adds a list of selected observations from which more certain values may be deduced; but it does not appear that he performed this calculation. The other elements of the orbits of the two satellites are pretty exact; the position of the planet was very favourable for these determinations. In 1797 the apparent orbits of the satellites were nearly right lines.

As to the supplementary satellites and their orbits, it would appear

* This was a 20-foot reflector with the *front view*, and Sir William's usual mounting.

from both memoirs that Sir William did not affect to speak of them with confidence. Though he had no doubt of their existence generally, yet he avowed that "to determine their numbers and situation would probably require an increase of illuminating power." The precision with which their periodic times, &c. are stated by various authorities must not be supposed to rest on any certain foundation, but on Sir William's approximations and shrewd guesses.

Sir John Herschel directed his attention to the satellites of *Uranus* in 1828–1832, and the results are to be found in our *Memoirs*, vol. viii. The situation of *Uranus* was unfavourable, the planet having considerable southern declination. From his own observations, combined with those of his father, Sir John deduced the following periodic times:—

$$\text{I.} = 8^{d}\ 16^{h}\ 56^{m}\ 31^{s}\cdot 3 \qquad \text{II.} = 13^{d}\ 11^{h}\ 7^{m}\ 12^{s}\cdot 6\,;$$

but "of other satellites," he says, "than these two I have no evidence."

M. Lamont, Director of the Observatory of Munich, commenced his observations of the satellites of *Uranus* in 1837. His memoir is printed in our *Transactions*, vol. xi. They relate to the principal satellites, I and II. M. Lamont believes that he once saw what he takes to be 4, the most distant of the supplementary satellites.

The mass of *Uranus* has been found to be,—

$\frac{1}{20008}$, the Sun = 1, by Sir W. H.'s observations

$\frac{1}{24605}$ by M. Lamont

$\frac{1}{17918}$ by Bouvard, from the perturbations of other planets by *Uranus*.

M. Lamont does not consider his results as very certain, since I and II gave somewhat discordant results; but he is of opinion that Bouvard's mass is certainly too large.

The determination of the mass of *Uranus* has become of great and pressing interest since the theoretical researches of MM. Le Verrier and Adams into the apparently irregular motion of the planet, have led to the memorable discovery of *Neptune*.

If we suppose the two planets to be equal, it is clear that the effect of *Uranus* to perturb the motion of *Neptune* will be more sensible than the reciprocal effect of *Neptune* upon *Uranus*, on account of the greater distance of *Neptune* from the sun. The theory of *Neptune*, therefore, must continue imperfect until a correct value of the mass of *Uranus* can be assigned. With this object in view, M. Otto Struve has undertaken a series of micrometrical measurements of the two principal satellites, which he hopes to complete about the beginning of February 1848. But though the planet is now 5° or 6° north of the equator, and therefore far more favourably placed than when Sir J. Herschel pursued his investigations, still the observations are very difficult, requiring steady

images and a perfectly transparent sky. In this unfavourable autumn only fourteen nights have hitherto been sufficiently fine. Generally speaking, the distances of II have been measured as satisfactorily as the angles of position, and only twice or thrice has the object been too faint to be well observed. The reduction is delayed until the series is completed.

When M. Struve had become familiarly acquainted with these two satellites, he turned his attention to their *supplementary* companions. After being twice deceived in measuring a small star instead of a satellite, he saw, on October 8, an object of which he made the following measures in position :—

	h m		
Oct. 8	11 16	Pulkowa M. T.	Position = 178°·7
	18		186·5
	35		178·8
	36		182·3
	42		176·7

An estimate of comparative distance made the distance = 14″·2.

These observations do not, indeed, prove the object to have been a satellite; but the difference between the first and last angles of position, if it had been a star, would, from the motion alone of *Uranus*, have been 9°. The following observations leave no doubt that a satellite was observed :—

1847.	Pulkowa M.T. h m	Position. °	No. Obs.	Pulkowa M.T. h m	Distance. ″	No. Obs.
Nov. 1	9 52	190·5	3	10 4	17·8	4
	10 23	194·0	3			
28	8 31	203·6	6	8 37	17·0	2
	9 48	202·1	4	8 52	16·7	2
Dec. 9	11 28	218·6	4	11 28	13·7	Estim.
10	5 53	180·1	4	6 3	17·0	4
	6 16	182·2	5			

Nov. 1. The satellite better seen than I and II, which are very near each other.

28. The satellite quite as visible as I.

Dec. 9. The images very good, but the observation not sure. The satellite seen by glimpses.

10. The satellite as well seen as II., but fainter than I.

The observations of Nov. 28 shew clearly enough that the object was a satellite: the *position* angle of a fixed star would have been altered 10°.

It may, at first sight, seem odd that *all* the observations are made on the *same side* of the planet. There are, however, many analogous cases among the satellites, if this should always occur. The satellites I and II, for instance, are found to alternate in brightness. There has been, however, no really fine observing night after Oct. 8, on which the satellite could have been observed on the other side.

The observations of this inferior satellite are not sufficiently

numerous to yield an accurate orbit. It may, however, be assumed, pretty safely, that it has been observed near its greatest elongation, *i.e.* that the apparent semi-axis is between 17″ and 18″; in which case it must have a period somewhere about 3 or 4 days.

Now the satellite has, approximately at least, always been observed at the same part of its orbit, and hence the intervals of 24, 27, and 12 days, must, approximately, be multiples of the periodic time. The hypothesis of a period of 3 days, which first presents itself (or more accurately, from the observations of Oct. 8 and Dec. 10, $2^d\,23^h\,45^m$), M. Struve finds wholly incompatible with the observation of Dec. 9, and he prefers a period of 4 days (more accurately, $3^d\,22^h\,10^m$); which, admitting a slight error on Nov. 1, agrees equally well with the observations. This result also accords better with the presumed mass of the planet; for the first period and greatest distance, 17″·5, gives the mass $\frac{1}{15480}$, larger than Bouvard's, while the second period assigns $\frac{1}{20860}$ to the mass, somewhat less than Lamont's, but yet a tolerable approximation to it.

The difference between M. O. Struve's period for this satellite, and that of $5^d\,21^h\,25^m$, assigned to Sir W. Herschel's, is considered by M. O. Struve to be due to an erroneous estimate of the semi-axis. He has no doubt of the identity of the two objects.

After remarking that the foregoing observations completely prove the existence of Herschel's 1st supplementary satellite, M. Struve remarks that the visibility of this satellite depends less upon the aperture of the telescope employed than on the sharpness of the image shewn. All the telescopes, in his opinion, which will shew I and II, are *large* enough to shew 1, if they are *good* enough. It is not fainter than the other two, but, from its greater proximity to *Uranus*, requires better defining power and freedom from stray light.

M. O. Struve has not hitherto seen any other supplementary satellite, but he remarks that the position of *Uranus* is every year becoming more favourable for this inquiry; and there can be little doubt of their speedy rediscovery, so far as they actually exist.

MISS MITCHELL'S COMET.

Observations.

HAMBURG. (M. Rümker.)

1847.	Hamburg M.T. h m s	R.A. ° ′ ″	N.P.D. ° ′ ″
Dec. 11	18 6 34·0	227 55 12·6	98 44 40·5
17	18 7 6·5	229 25 22·0	93 44 17·6
18	17 34 54·4	40 11·7	92 55 49·9
19	18 3 24·7	229 56 5·0	92 5 1·7

Elements. By M. George Rümker.*

Perihelion Passage, 1847, November 14·1763.

Longitude of Perihelion	274 26 10·8	Eq. Oct. 17.
Node	190 55 55·6	
Inclination	72 10 50·7	
Log Per. Dist.	9·5184953	Motion Retrograde.

COLLA'S COMET.

Observations.

STARFIELD. 20-foot Equatoreal Reflector. (Mr. Lassell.)

1847.	Greenwich M.T. h m s	Comet—Star. R.A. m s	N.P.D.
Dec. 28	8 37 12·6	+0 30·36	
	8 52 15·5		+2 0·4
30	6 26 9·5	−1 0·90	
	7 7 8·2		+1 14·8

These are instrumental results, uncorrected.

"On Dec. 28 the comet was compared in R.A. with a star *a*, and in N.P.D. with a different star *b*, both of the 9·10th or 10th magnitude. These stars were again compared with a third star *c*, of about 8th magnitude. Assuming approximate apparent place of *c* to be,

R.A. $19^h\,46^m\,33^s$ N.P.D. $35^\circ\,43'\,40''$ †

b follows *c* in	1 m 51·4 s	and is south of *c* 2 ′ 8·3 ″
a precedes *b* by	0 32·7	and is south of *b* 3 28·8

"On Dec. 30 the apparent place of the star of comparison is approximately,

R.A. $19^h\,55^m\,35^s$ N.P.D. $36^\circ\,4'\,30''$ (8 mag.)

"No illumination whatever could be used, on account of the excessive faintness of the comet. For the differences in N.P.D. I was obliged to use a somewhat ruder micrometer than Dollond's, and of a different construction. The sky on the 30th was of at least average clearness, yet the comet was almost the *minimum visibile*, with the full aperture of 24 inches."

* A rough ephemeris of the comet for the first half of January, also by M. George Rümker, accompanied these elements, but arrived too late to be of use.

† *c* has a close comparison of 10·11 mag.

A Method of Calculating the Orbit of a Planet or Comet from Three observed Places. By Professor Challis.

This method resembles in principle that of Laplace, of which it may be regarded an extension, the object of the author being to include in the calculation differential coefficients of the *third* and *fourth* orders, for the purpose of insuring greater accuracy in the final results. The equations by which the problem is solved are formed as follows. If α and β be the observed right ascension and north polar distance of the body at one of the given times, corrected to a given equinox and given position of the earth's equator, and x, y, z be its co-ordinates at the same time, having their origin at the place of the observer, these quantities are related to each other by the two equations

$$x = y \cot \alpha, \quad x = z \cos \alpha \tan \beta.$$

Each observed place furnishes two such equations. To include parallax the origin of co-ordinates is transferred to the earth's centre. If ϱ be the distance of the body from the earth, and q be the aberration constant, the effect of aberration is taken into account by changing x, y, z respectively into $x - \frac{dx}{dt} q\varrho$, $y - \frac{dy}{dt} q\varrho$, $z - \frac{dz}{dt} q\varrho$. The origin of co-ordinates is then transferred to the centre of the sun, by calculating exactly the sun's co-ordinates at the three times of observation. Thus six equations are formed in which the unknown quantities are the heliocentric co-ordinates of the body. The co-ordinates at the first and last times of observation are expressed in terms of the co-ordinates at the intermediate time, by series including differential co-efficients of the *fourth* order of the latter co-ordinates. The six unknown quantities to be found are then, the heliocentric co-ordinates x_2, y_2, z_2 at the middle time, and their first differential co-efficients $\frac{dx_2}{dt}$, $\frac{dy_2}{dt}$, $\frac{dz_2}{dt}$. A first solution is obtained by including only differential co-efficients of the second order, and neglecting the aberration terms. This conducts to the following values of the co-ordinates,—

$$x_2 = \mathrm{M} + \frac{\mathrm{N}}{r_2^3}, \quad y_2 = \mathrm{M}' + \frac{\mathrm{N}'}{r_2^3}, \quad z_2 = \mathrm{M}'' + \frac{\mathrm{N}''}{r_2^3},$$

r_2 being the body's heliocentric distance. Hence

$$r_2^2 = \left(\mathrm{M} + \frac{\mathrm{N}}{r_2^3}\right)^2 + \left(\mathrm{M}' + \frac{\mathrm{N}'}{r_2^3}\right)^2 + \left(\mathrm{M}'' + \frac{\mathrm{N}''}{r_2^3}\right)^2.$$

For solving this equation, a graphical method given by I. I. Waterston, Esq. in the *Monthly Notice* of the Royal Astronomical Society for December 1845, is recommended. The value of r_2 being

found, those of x_2, y_2, z_2, and their first differential co-efficients, are readily derived, the equations for determining them being linear.

By means of the first approximate values of the unknown quantities, the second order of approximation is proceeded with so as to include differential co-efficients of the third order and the more important aberration terms. The third approximation includes differential co-efficients of the fourth order, and some small additional aberration terms. These approximations are so conducted that the quantities obtained are *corrections* to the first obtained values, and it is consequently not necessary to calculate with seven-figure logarithms.

The values of x_2, y_2, z_2, $\frac{dx_2}{dt}$, $\frac{dy_2}{dt}$, $\frac{dz_2}{dt}$, being thus obtained as accurately as possible, the elements of the orbit are readily derived by known formulæ. As the observed right ascension and north polar distance were not corrected into latitudes and longitudes, the elements are by this calculation referred to a plane through the sun's centre parallel to the earth's equator in a given position. By a simple computation they may be transferred to the plane of the ecliptic. But the original form is the most convenient for obtaining geocentric co-ordinates in terms of the eccentric anomaly, for the purpose of calculating an ephemeris; and also for deriving equations of condition by which the elements may be corrected by future observations. The method of doing this the author proposes to describe at another opportunity.

A brief Notice of the Imperial Observatory of Poulkova.

By the Astronomer Royal.*

The Observatory of Poulkova was built on the plans furnished by its director, M. Struve; the instruments are, for the most part, constructed according to his special instructions. The peculiar scope of this noble establishment is *sidereal* astronomy in its widest sense; and Mr. Airy strongly expresses his admiration of the definiteness of the purpose which M. Struve had in his mind, and of the thorough manner in which it has been carried into effect. He says that "no astronomer can feel himself perfectly acquainted with modern astronomy in its most highly cultivated form, whether as regards the personal establishment, the preparation of the buildings, the selection or construction of the instruments, or the delicacy of using them, who has not well studied the Observatory of Poulkova. To this excellence many antecedent circumstances have

* The Astronomer Royal visited Poulkova last summer, and gave orally an account of the Observatory at the meeting of the Society in November, the substance of which was communicated in a letter to Professor Schumacher, and printed in the *Astronomische Nachrichten.*

materially contributed: the first of these is the personal character of M. Struve; his mature experience obtained before the intention of building the new observatory had been formed; his vigour in arranging the plans on a large scale, and in superintending constructions even to the minutest point, and his perseverance and skill in arranging the subsequent proceedings of the observatory." The liberality of the Emperor, the freedom of choice as to site, instruments, &c., have been admirably employed by the director. The character of the buildings, in addition to their perfect suitability to their design, is that of splendour without extravagance. The foundations are most carefully laid, and solid beyond any former example.*

The large Equatoreal, by Merz and Mahler, is the instrument which has principally extended the fame of the Poulkova Observatory. The optical part is doubtless admirable, though, perhaps, more control over the adjustment of the object-glass would be desirable; but Mr. Airy was far from satisfied with the rest of the instrument. It did not obey its slow motions in right ascension and declination with promptitude or accuracy, and the clock movement was deficient in power. In short, though in the delicate and experienced hands of M. Otto Struve the telescope is made to yield the utmost of its powers, Mr. Airy does not consider the instrument, as he saw it, a good specimen of mechanism.

The Heliometer, by the same artists, met with much greater admiration; and, indeed, Mr. Airy seems to have been very much impressed with the beauty and excellence of all the other instruments. He goes so far as to say that he considers the meridional observations at Poulkova to be greatly superior to those of any other observatory with which he is acquainted. The Transit and Vertical Circle of Ertel, the Meridian Circle and Prime Vertical Telescope of Repsold, are praised, with some critical remarks, but no serious drawback. Some doubt is expressed whether the Prime Vertical Telescope would, in other hands than those of M. Struve himself, give quite such marvellous results as he obtains from it: still, in Mr. Airy's judgment, a prime vertical telescope is far superior to any zenith sector yet contrived for the investigation of aberration, parallax, &c., or small differences of latitude; and he considers the Poulkova results as leaving all competition far behind.

Mr. Airy "had the pleasure of witnessing complete observations made by M. Struve with the Prime Vertical Telescope, and pays the tribute of his admiration to the caution, the delicacy, the steadily waiting till the proper time, the promptitude at the proper time, which distinguish the director's mode of observing."

The excellence of the levels attached to the instruments at Poulkova, and the successful precautions constantly practised there

* The Observatory and its instruments may be well understood from the beautiful work published by M. Struve, *Description de l'Observatoire Astronomique Central de Poulkova*, St. Pétersbourg, 1845, 4to. with a volume of plates, which has been distributed most liberally among astronomers.

to avoid error in their use, are particularly noticed. The construction of the Standard Barometer is pronounced to be "admirable," and the noble Library* considered "to be probably the most complete in the world in reference to its peculiar subjects."

On the Transit Instrument at the Bombay Observatory.

By Capt. Shortrede.

Captain Shortrede gives a short account of the instrument, its mounting, &c. before he became acquainted with it. Such mistakes as he relates can scarcely occur a second time, and therefore they may be passed over in silence.

When Capt. Shortrede visited the Bombay Observatory during his trigonometrical operations, he learned that the instrument was considered incurably defective. A full consideration, however, led him to a different opinion; and as he is himself a workman, and from his former connexion with the Mint as assistant-engineer, had great facilities for procuring the best assistance which the country afforded, he undertook the re-erection of the instrument, which, his his own services being gratuitous, would not exceed 300 rupees. This offer being communicated to the Governor, the sum specified was readily advanced.

The stone pillars are two feet square: the upper part of one had been greatly split and shaken by unskilful perforations; and Capt. Shortrede directed the upper 15 inches of each to be taken off. These he replaced by two blocks of Puna stone, which are 18 inches square at bottom, sloping to 12 inches square at top. This size seemed sufficient for steadiness, and was as large as could well be procured at Puna or transported to Bombay. Due care was taken to attach the blocks perfectly to the piers.

The new Y plates were of bell-metal, cast at the Mint, and well and truly worked; particular care was taken that the plate bore truly on the stone near the screw-holes.

The pivots of the axis are supported throughout their length; the motions for every adjustment were found free and without shake. Instead of the usual Y, Capt. Shortrede adopted a collar bearing, which he intended should exactly fit the pivots. The workman, however, made them somewhat large, and, as he finished them by grinding, not quite true. Having no time to get new collars made, Capt. Shortrede had a groove cut out at the bottom of the bearing and at the top of the covering piece, in each of which a slip of wash-leather was secured by lac-varnish. These

* A Catalogue of this Library has been recently published, *Librorum in Bibliothecâ Speculæ Pulcovensis contentorum Catalogus Systematicus*, Petropoli Typis Acad. Scient. 1845, 8vo.

do not interfere with the bearing, and they stop the dust before it comes to the bearing. The constant daily shower of sand from the sea-breeze and neighbouring shore would soon destroy any pivot working in the ordinary way, and this consideration suggested the collar mounting, which was intended to be as close fitting as possible. No iron was used in the work, the liability to rust in such a situation makes the material unsuitable.

The instrument thus fitted up continues to work satisfactorily. There are no counterpoises, Capt. Shortrede (luckily perhaps) not having had time to procure them before quitting Bombay.

Letter from Mr. Dawes announcing the Detection of Two new Double Stars.

"On December 12th, 1847, I observed 42 (*c*) *Orionis* to be close double; magnitudes 5 and 9; distance about 1″·8. An elegant object which could scarcely have been overlooked by the Herschels and Struve, if it has not recently come out.

"On January 15th, 1848, *η Orionis* was discovered to be close double; the magnitudes of the components being 4 and 5, and distance 1″. It is a beautiful object of its class, and can scarcely fail to prove a *binary* system. Sir W. Herschel observed this star in 1781, and, on account of a small star distant about two minutes in the n. f. quadrant, entered it as vi. 67. But he did not notice it as close double; neither did Struve at Dorpat. Yet, with a 6-inch aperture, it is now perfectly separable. As, therefore, it may be an object of much interest, the attention of double-star observers is specially requested for it during its present apparition."

Longitude of Port Essington. By Mr. H. Breen, Jun. of the Royal Observatory, Greenwich.

The meridian passages of the moon from which the following longitude is deduced were observed by Capt. O. Stanley, R.N. F.R.A.S. The original observations were forwarded some time ago to the Society by Capt. Stanley, and Mr. Breen recently undertook their reduction, which he has performed thus:—

He first corrected the observations for errors of azimuth and level, the instrument being supposed to be adjusted in collimation. From the transits thus corrected and an approximate longitude, the errors and rates of the mean solar chronometer on the days of observation were computed, and from these data the observed right ascension of the moon was deduced. Mr. Breen then interpolated the moon's right ascension from the *Nautical Almanac* (*Moon-Culminating Stars*) for two assumptions of longitude differing one minute, with fourth differences inclusive; and finally applied the correction which was required to satisfy the observations of Green-

wich, Cambridge, Edinburgh, and Hamburg. The final results are,—

East Longitude, Port Essington.

		h	m	s	
1839. June	20	8	48	69·23	
	24			18·24	
	25			31·12	
Aug.	19			44·37	
	22			40·82	
Sept.	16			55·00	
	17			54·10	
	18			53·58	
	20			51·35	
	21	8	48	28·53	
Mean		8	48	44·64	East.

Two observations on June 22 and Sept. 22, which seem to have been noted 1^m too late, are omitted.

Mr. Breen has also furnished the following longitudes deduced from observations contained in the *Monthly Notice* for December 1846.

1. Raine's Island. Occultation ν *Aquarii.* July 2, 1844.

East Long. $= 9^h\ 36^m\ 32^s{\cdot}86 + 1{\cdot}382\,(x-e) - 1{\cdot}264\,(y-f) + 1{\cdot}897\,n$. Immersion.

$= 63{\cdot}77 + 1{\cdot}545\,(x-e) - 0{\cdot}701\,(y-f) - 1{\cdot}729\,n$. Emersion.

2. Nepean Island, *Torres Straits.* Occultation λ *Libræ.* March 27, 1845.

East Long. $= 9^h\ 35^m\ 7^s{\cdot}45 + 1{\cdot}422\,(x-e) + 1{\cdot}332\,(y-f) + 2{\cdot}013\,n$. Emersion.

3. Darnley Island. Occultation ϱ *Sagittarii.* May 24, 1845.

East Long. $= 9^h\ 35^m\ 15^s{\cdot}40 + 1{\cdot}406\,(x-e) - 0{\cdot}928\,(y-f) + 1{\cdot}746\,n$. Immersion.

x and y are the seconds of space which are to be *added* to the right ascension and north polar distance of the moon in the *Nautical Almanac* to produce the correct place.

e and f are the seconds of space which ought to be *added* to the assumed right ascension and north polar distance of the star.

n is the correction to the moon's semidiameter taken from the *Nautical Almanac.*

The assumed place of ν *Aquarii* is taken from the *Greenwich Catalogue of* 1439 *Stars;* λ *Libræ* and ϱ *Sagittarii* from the *Nautical Almanac of* 1845, section *Occultations.*

Self-luminous Spot in the Moon.

On the 11th of December last, at 6 P.M. while Mr. Hodgson, of Fir Grove, Eversley, was observing the dark body of the moon, "a bright spot, about $\frac{1}{4}$ the angular diameter of *Saturn*, was perceived, which, though it varied in intensity like an intermitting light, was at all times visible." On this occasion Mr. H. used an achromatic telescope of 5 foot focal length, and powers 50 and 80. The bright spot was best seen by the higher power, probably, as he suggests, because the field was smaller and darker, but it was instantly visible to the most uninitiated eye when the bright part of the moon was excluded from the field.

On the following day glimpses of the same spot were caught between passing clouds with a Newtonian reflector; power 40.

From Mr. H.'s sketch, the bright spot is about 5′ below the real northern point and near the following limb.

ERRATUM IN THE PRESENT NUMBER.

Page 36, the sign of the Corr. for Aberr. in N.P.D. must be changed throughout: it was computed for Declination, and not altered.

NOTE.

Copies of the present Notice will be forwarded to many of our Foreign Members and Correspondents in the least expensive manner which can be discovered; but the rules of postage in different countries are so various, and the rates charged by the English Post-office for over-sea letters so exorbitant, that some difficulty is felt as to the best course to be pursued. Information on this point, or assistance, will be very acceptable.

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